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**REMEDIAL ACTION
SAMPLING AND ANALYSIS PLAN
PART I - FIELD SAMPLING PLAN
REVISION: 2**

**ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

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SAMPLING AND ANALYSIS PLAN
PART I - FIELD SAMPLING PLAN**

**ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

MARCH 24, 1992

REVISION: 2

PREPARED FOR:

ENVIRO-CHEM TRUSTEES

PREPARED BY:

**ENVIRONMENTAL RESOURCES MANAGEMENT-NORTH CENTRAL, INC.
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DEERFIELD, ILLINOIS 60015
PROJECT NO. 91104**

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been developed and is being submitted in accordance with Exhibit A to the Consent Decree for the Remedial Action to be conducted at the Environmental Conservation and Chemical Corporation (Enviro-Chem) Site, located in Zionsville, Indiana. The Sampling and Analysis Plan for the site consists of the Part I - FSP and the Part II - Quality Assurance Project Plan (QAPP).

The FSP describes the sampling and data-gathering methods to be used for the Enviro-Chem Site Remedial Action in detail. The FSP has been developed in accordance with the U.S. Environmental Protection Agency's (USEPA's) draft document "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," dated March 1988. Guidelines developed for the selection and definition of field methods, sampling procedures, and custody are based on the USEPA's "Compendium of Superfund Field Operations Methods," dated December 1987.

The original draft of this FSP, which was submitted to the USEPA on March 1, 1989, was previously revised to address comments provided by the USEPA in a letter dated April 19, 1991, and has now been revised to address USEPA comments provided in a letter dated February 21, 1992.

2.0 SITE BACKGROUND

2.1 Site Description

The Enviro-Chem Site is located in Boone County, approximately 10 miles northwest of Indianapolis, on U.S. Highway 421 in Zionsville, Indiana (Figure 2-1). The site occupies 6.5 acres west of the Northside Sanitary Landfill (NSL), a closed solid waste disposal facility. The Enviro-Chem Site is also bounded on the south and east by NSL property. An unnamed ditch separates the two facilities along the eastern boundary. Several residential homes are located within one-half mile of the facility to the north and west (Figure 2-2).

In 1977, Enviro-Chem began operations at the site, which consisted of the recovery, reclamation, and brokering of primary solvents, oils, and other wastes. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal. Processes to reclaim solvents and oil included distillation, evaporation, and fractionation.

USEPA investigations concerning the accumulation of contaminated storm water on site, improper drum inventory, and several spill incidents lead to civil law suits, and finally the placement of Enviro-Chem into receivership in July 1981. Drum shipments to the site were halted in February 1982. Surface clean-up activities conducted by USEPA contractors during 1983 and 1984 included the removal of cooling pond waters, waste drums, tank wastes, contaminated soil, and cooling pond sludge.

A Remedial Investigation/Feasibility Study (RI/FS) was conducted by CH2M Hill for the USEPA from 1983 through 1986. The Record of Decision (ROD) for the site was issued on

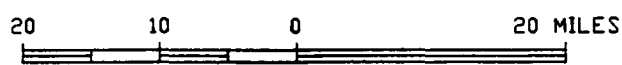
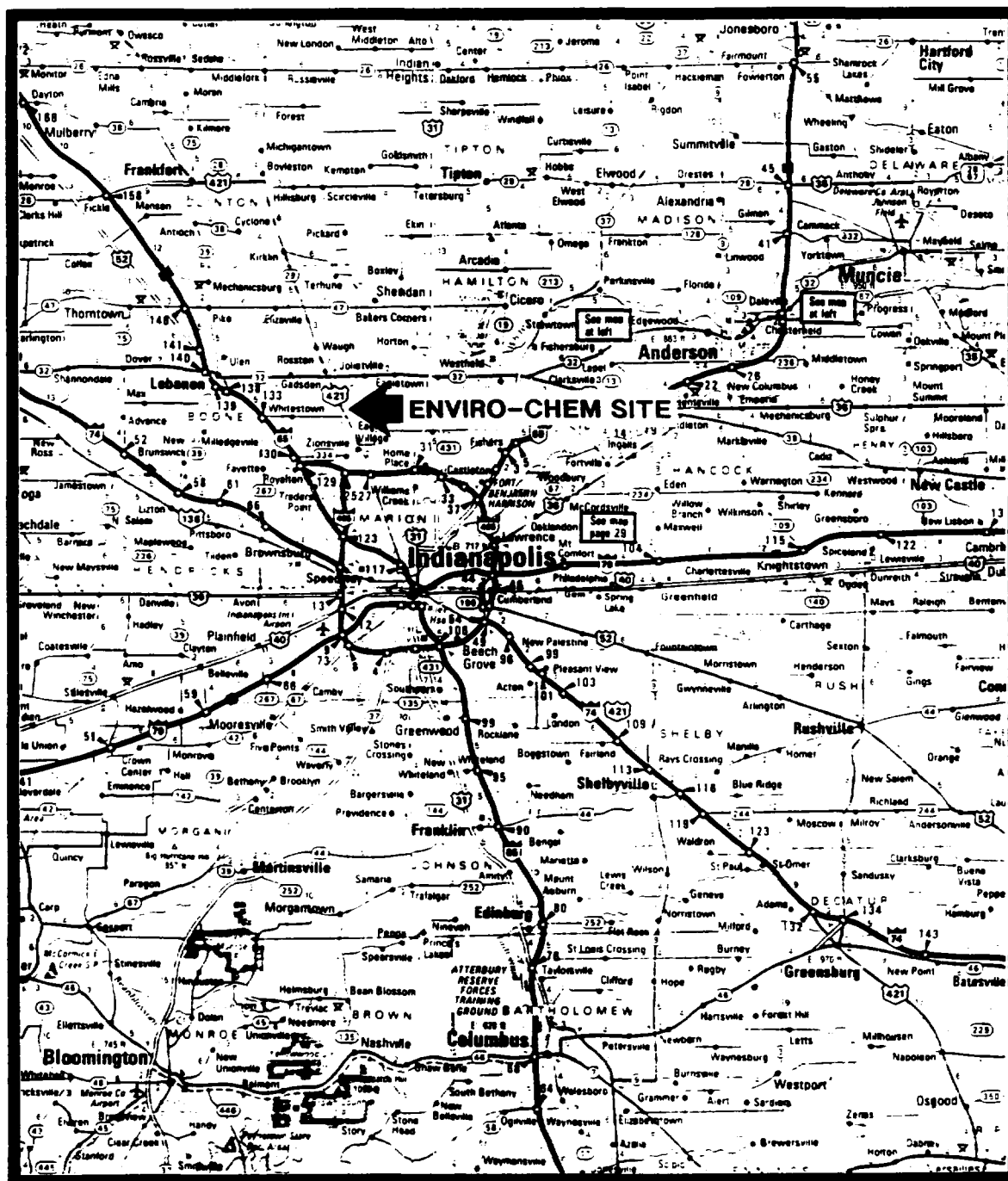
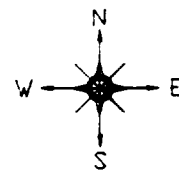


FIGURE 2-1

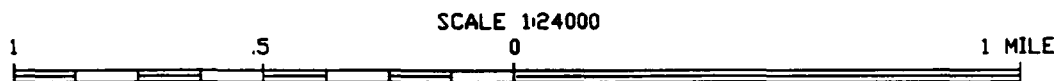
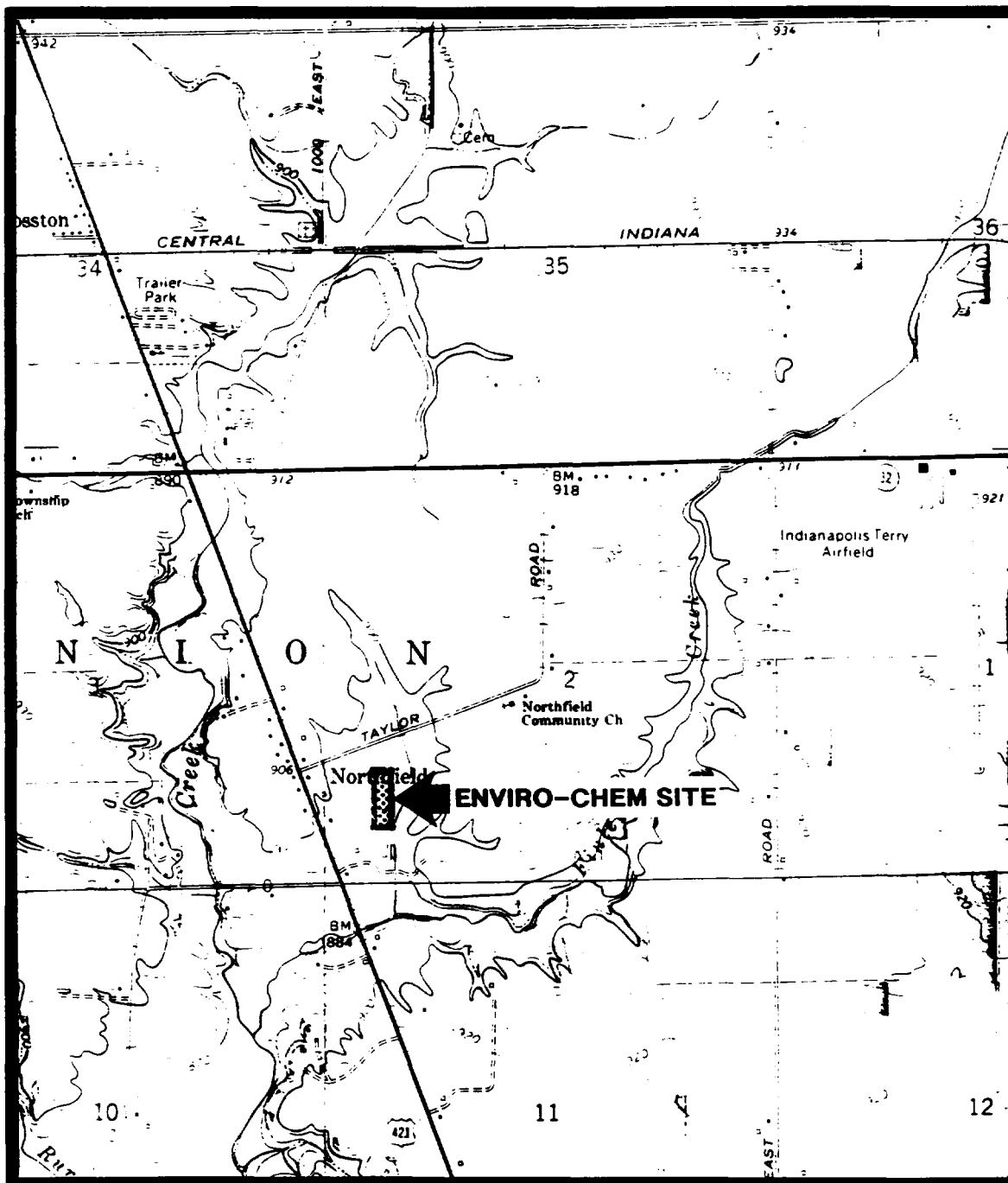
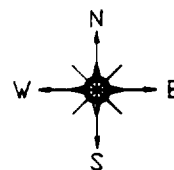
**SITE LOCATION MAP
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**



PROJECT: 91104
DATE: 12/4/91
APPROVED: SHEA & GOULD
CHECKED: MO
DESIGNED: FSP



ROSSTON QUADRANGLE
INDIANA-BOONE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
1969



CONTOUR INTERVAL 10 FEET

FIGURE 2-2

SITE MAP
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA



PROJECT: 91104
REPORT: FSP
DATE: 12/4/91
CHECKED: SHEA & GOULD
APPROVED: [Signature]
DATE: 12/4/91



September 25, 1987, and amended on June 7, 1991, and the Consent Decree for remediation of the site was entered on September 10, 1991.

2.2 Remediation Activities

The site will be remediated under the terms of a Consent Decree; Exhibit A to the Consent Decree, the Remedial Action Plan, identifies the remediation activities to be conducted at the Enviro-Chem Site, which include the:

- o Demolition and removal of containers and debris from the site;
- o Installation and operation of an in situ soil vapor extraction (SVE) system;
- o Installation of a cover in accordance with the requirements of the Resource Conservation and Recovery Act - (RCRA) Subtitle C (RCRA-compliant cover);
- o Implementation of access restrictions; and
- o Monitoring of vapor, soil, and subsurface and surface water to evaluate the effectiveness of remediation activities.

The Exhibit A to the Consent Decree design of the in situ SVE system includes a network of 28 extraction and 26 injection trenches, one or more vacuum pumps for extraction of soil gas, one or more injection pumps for injection of treated air, and a two-stage activated carbon adsorption

system. However, the final design of the system may vary, because the bid package requires the contractors to provide their own design to meet performance standards in terms of soil concentrations. At some point in the SVE process, the extraction trenches will be converted to injection trenches, and vice versa, to improve the vapor extraction of contaminants. In addition, the installation of the following components of the RCRA-compliant cover will prevent infiltration of ambient air and water into the SVE system during operation: (1) a minimum of 1 foot of compacted, highly impermeable native soil, (2) a 60-mil, high-density polyethylene (HDPE) plastic membrane, and (3) 6 inches of sand. The remaining components of the RCRA-compliant cover (a minimum of 1 foot of miscellaneous soil/fill and 1 foot of topsoil, as well as the appropriate vegetation) will be installed at a later date.

Access restriction provisions include the installation of a fence around the site's perimeter, posting of warning signs, and recording of deed restrictions (to the best of the Settling Defendants' ability) prohibiting: (1) usage of the site for excavation and development, (2) usage of subsurface water from the saturated till and the underlying sand and gravel unit, and (3) installation of new water wells other than monitoring wells.

The monitoring of subsurface and surface water will be conducted by using both on-site and off-site monitoring wells completed in the saturated till, off-site monitoring wells completed in the sand and gravel unit, and upstream and downstream surface water sampling locations in the unnamed ditch separating the Enviro-Chem and NSL sites.

After the in situ SVE system is installed, it will be operated until the Soil Clean-up Verification has been achieved. As defined in Section 4.2 of Exhibit A to the Consent Decree, the Soil Clean-up Verification will be accomplished by consecutively demonstrating the achievement of the Soil Vapor Criterion, the On-Site Till Water Criterion, and the Soil Sample Criterion

described in Exhibit A to the Consent Decree. After these criteria have been met, the subsurface and surface water will be monitored semiannually for seven years. All of the sampling activities to be conducted during remediation of the site are detailed in this Field Sampling Plan.

3.0 SAMPLING OBJECTIVES

The objectives of the sampling activities are to confirm the achievement of the required soil cleanup ("Soil Clean-up Verification") and to determine the effectiveness of the remediation in controlling the migration of chemicals that are not removed from the soils by in situ SVE ("Compliance Monitoring").

The overall sampling objective is to collect data of sufficient quality and quantity to achieve the highest level of confidence and, therefore, the lowest level of uncertainty in determining the completeness and effectiveness of the remediation activities. The sampling and analytical program for the Enviro-Chem Site, described in the following sections, is designed to achieve this overall objective.

4.0 SAMPLE LOCATION AND FREQUENCY

With the exception of the background water samples, the sampling locations and frequency for all media to be sampled during the remediation activities (i.e., extracted soil vapor, soil, and subsurface and surface water) are specified in Exhibit A to the Consent Decree. The sampling locations and frequency presented in Exhibit A to the Consent Decree and the proposed background water sampling locations and frequency, in accordance with the requirements set forth in Table 3-1 of Exhibit A to the Consent Decree, are described in the following subsections.

4.1 Extracted Soil Vapor

The SVE system will be installed with sample taps to allow the collection of extracted soil vapor from: (1) the combined air flow prior to entering the activated carbon system, and (2) individual trenches. The combined vapor flow will be sampled daily during the first week of operation, weekly for the following four weeks, and monthly thereafter. Samples will be analyzed for the parameters listed in Table 4-1. The combined vapor flow rate will be monitored and recorded to provide sufficient data to calculate the mass of the organics removed from the soil.

A vapor sample will be collected from each individual extraction trench during the first week of operation of the SVE system and analyzed for the parameters listed in Table 4-1 to establish a baseline of organics removal per trench. After the combined mass flow rate extracted per day is reduced to 5 percent of the initial week's rate, additional vapor samples from individual extraction trenches will be obtained every two months and analyzed for the compounds listed in Table 4-1. If two consecutive vapor samples from an individual trench show concentrations of

TABLE 4-1

**SOIL VAPOR CONCENTRATIONS IN EQUILIBRIUM
WITH ACCEPTABLE SOIL CONCENTRATIONS**

**ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

Parameter⁽¹⁾	Soil Vapor Concentration ⁽²⁾ (ppm by volume)
Volatile Organics:	
Acetone	254
Chloroform	496
1,1-Dichloroethane	3.4
1,1-Dichloroethene	515
Ethyl Benzene	9,316
Methylene Chloride	22.4
Methyl Ethyl Ketone	13
Methyl Isobutyl Ketone	233
Tetrachloroethene	16.8
Toluene	36,556
1,1,1-Trichloroethane	2,819
1,1,2-Trichloroethane	1.1
Trichloroethene	71.5
Total Xylenes	4,794
Base Neutral/Acid Organics:	
Phenol	1.4

Notes:

⁽¹⁾Compounds detected in the soils at least once during the Remedial Investigation at concentrations above the Acceptable Soil Concentrations listed in Table 3-1 of Exhibit A to the Consent Decree.

⁽²⁾From Table 4-1 of Exhibit A to the Consent Decree.

organics below those shown in Table 4-1, that individual trench can be shut down while the rest of the SVE system is kept operating. Table 4-2 summarizes the number of extracted soil vapor samples to be collected based on an estimated one year of operation of the SVE system and six months to reduce the initial combined mass extraction flow rate per day to 5 percent of the initial rate.

As indicated in Section 4.2.1 of Exhibit A to the Consent Decree, the "restart spike" method will be used to confirm the achievement of the Soil Vapor Criterion for Soil Clean-up Verification. In accordance with these requirements, combined soil vapor samples will be collected after each of four consecutive restart spikes, which will be conducted once every two weeks and analyzed for the compounds in Table 4-1. The number of Soil Vapor Criterion samples to be collected will depend on the achievement of vapor sample results at or below the concentrations shown in Table 4-1 for four consecutive restart spikes. The restart spike method consists of periodically shutting down the SVE system for three days and then restarting all extraction and injection trenches.

4.2 Soil

After the Soil Vapor Criterion and On-Site Till Water Criterion for Soil Clean-up Verification have been met as defined in Sections 4.1 and 4.3 of this FSP and specified in Section 4.2 of Exhibit A to the Consent Decree, a total of 16 soil samples will be collected from "hot" spot areas, and four samples will be obtained from randomly selected points elsewhere on site (other than background locations). The sampling locations will be chosen by the USEPA and Indiana Department of Environmental Management (IDEM). Each soil sample will be analyzed for the compounds listed in Table 4-3. The results of these analyses will be evaluated to determine

TABLE 4-2

**SUMMARY OF INVESTIGATIVE AND QUALITY CONTROL SAMPLES TO BE COLLECTED
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA
(Page 1 of 4)**

Sample Matrix	Field Parameters	Laboratory Parameters ⁽¹⁾	Investigative Samples ⁽²⁾			Field QA/QC Samples ⁽³⁾									Total
						Field Duplicate			Field Blanks			MS/MSD ^(4,5)			
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Combined Extracted Soil Vapor	—	Volatiles Phenol	1	26	26	—	—	—	—	—	—	—	—	—	26
			1	26	26	—	—	—	—	—	—	—	—	—	26
Individual Extraction Trenches Soil Vapor	—	Volatiles Phenol	28	4	112	—	—	—	3	4	12	—	—	—	124
			28	4	112	—	—	—	3	4	12	—	—	—	124
Soil	—	Volatiles Phenol	20	1	20	2	1	2	—	—	—	—	—	—	22
			20	1	20	2	1	2	—	—	—	—	—	—	22
On-Site Subsurface Water ^(6,7)	pH Specific Conductance Temperature	1,1-DCA	4	18	72	1	18	18	1	18	18	1	18	18	126
		Other Volatiles	4	18	72	—	—	—	—	—	—	—	—	—	72
		BNAs	4	18	72	—	—	—	—	—	—	—	—	72	
		PCBs	4	18	72	—	—	—	—	—	—	—	—	72	
		Chromium VI	4	18	72	—	—	—	—	—	—	—	—	72	
		Tin	4	18	72	1	18	18	1	18	18	—	—	108	
		Antimony	4	18	72	1	18	18	1	18	18	—	—	108	
		Other Metals	4	18	72	—	—	—	—	—	—	—	—	72	
		Cyanide	4	18	72	—	—	—	—	—	—	—	—	72	
Off-Site Subsurface Water ^(7,8)	pH Specific Conductance Temperature	1,1-DCA	2	5	10	—	—	—	—	—	—	—	—	—	10
		Other Volatiles	11	18	198	2	18	36	2	18	36	1	18	18	288
		BNAs	11	18	198	2	18	36	2	18	36	1	18	18	288
		PCBs	11	18	198	2	18	36	2	18	36	1	18	18	288
		Chromium VI	11	18	198	2	18	36	2	18	36	—	—	—	270
		Tin	2	5	10	—	—	—	—	—	—	—	—	—	10
		Arsenic	11	18	198	2	18	36	2	18	36	—	—	—	270
		Antimony	2	5	10	—	—	—	—	—	—	—	—	—	10
		Other Metals	11	18	198	2	18	36	2	18	36	—	—	—	270
		Cyanide	11	18	198	2	18	36	2	18	36	—	—	—	270

TABLE 4-2

SUMMARY OF INVESTIGATIVE AND QUALITY CONTROL SAMPLES TO BE COLLECTED
 ENVIRO-CHEM SITE
 ZIONSVILLE, INDIANA
 (Page 2 of 4)

Sample Matrix	Field Parameters	Laboratory Parameters ⁽¹⁾	Investigative Samples ⁽²⁾			Field QA/QC Samples ⁽³⁾									Total
						Field Duplicate			Field Blanks			MS/MSD ^(4,5)			
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Surface Water ⁽⁶⁾	pH	Volatiles	2	18	36	1	18	18	1	18	18	1	18	18	90
	Specific Conductance	BNAs	2	18	36	1	18	18	1	18	18	1	18	18	90
	Temperature	PCBs	2	18	36	1	18	18	1	18	18	1	18	18	90
		Chromium VI	2	18	36	1	18	18	1	18	18	--	--	--	72
		Arsenic	2	18	36	1	18	18	1	18	18	--	--	--	72
		Other Metals	2	18	36	1	18	18	1	18	18	--	--	--	72
		Cyanide	2	18	36	1	18	18	1	18	18	--	--	--	72
Additional Off-Site Background Subsurface Water from Investigative Upgradient Wells ^(6,7,9)	pH	1,1-DCA	2	1	2	--	--	--	--	--	--	--	--	--	2
	Specific Conductance	Other Volatiles	2	1	2	--	--	--	--	--	--	--	--	--	2
	Temperature	BNAs	2	1	2	--	--	--	--	--	--	--	--	--	2
		PCBs	2	1	2	--	--	--	--	--	--	--	--	--	2
		Chromium VI	2	1	2	--	--	--	--	--	--	--	--	--	2
		Tin	2	1	2	--	--	--	--	--	--	--	--	--	2
		Antimony	2	1	2	--	--	--	--	--	--	--	--	--	2
		Other Metals	2	1	2	--	--	--	--	--	--	--	--	--	2
	Cyanide	2	1	2	--	--	--	--	--	--	--	--	--	2	
Additional Background Surface Water from Investigative Upstream Location ^(6,9)	pH	Volatiles	1	1	1	--	--	--	--	--	--	--	--	--	1
	Specific Conductance	BNAs	1	1	1	--	--	--	--	--	--	--	--	--	1
	Temperature	PCBs	1	1	1	--	--	--	--	--	--	--	--	--	1
		Chromium VI	1	1	1	--	--	--	--	--	--	--	--	--	1
		Arsenic	1	1	1	--	--	--	--	--	--	--	--	--	1
		Other Metals	1	1	1	--	--	--	--	--	--	--	--	--	1
		Cyanide	1	1	1	--	--	--	--	--	--	--	--	--	1
Soil from Monitoring Well and Piezometer Borings	--	Particle Size	15	1	15	2	1	2	--	--	--	--	--	--	17

TABLE 4-2

**SUMMARY OF INVESTIGATIVE AND QUALITY CONTROL SAMPLES TO BE COLLECTED
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA
(Page 3 of 4)**

Sample Matrix	Field Parameters	Laboratory Parameters ⁽¹⁾	Investigative Samples ⁽²⁾			Field QA/QC Samples ⁽³⁾									Total
						Field Duplicate			Field Blanks			MS/MSD ^(4,5)			
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Subsurface Water from Background-Only Wells ^(7,9,10)	pH Specific Conductance Temperature	1,1-DCA	2	6	12	1	1	1	1	1	1	1	1	1	15
		Other Volatiles	2	6	12	1	1	1	1	1	1	1	1	1	15
		BNAs	2	6	12	1	1	1	1	1	1	1	1	1	15
		PCBs	2	6	12	1	1	1	1	1	1	1	1	1	15
		Chromium VI	2	6	12	1	1	1	1	1	1	—	—	—	14
		Tin	2	6	12	1	1	1	1	1	1	—	—	—	14
		Antimony	2	6	12	1	1	1	1	1	1	—	—	—	14
		Other Metals	2	6	12	1	1	1	1	1	1	—	—	—	14
		Cyanide	2	6	12	1	1	1	1	1	1	—	—	—	14
Surface Water from Background-Only Location ^(6,9,10)	pH Specific Conductance Temperature	Volatiles	1	6	6	1	1	1	1	1	1	1	1	1	9
		BNAs	1	6	6	1	1	1	1	1	1	1	1	1	9
		PCBs	1	6	6	1	1	1	1	1	1	1	1	1	9
		Chromium VI	1	6	6	1	1	1	1	1	1	—	—	—	8
		Arsenic	1	6	6	1	1	1	1	1	1	—	—	—	8
		Other Metals	1	6	6	1	1	1	1	1	1	—	—	—	8
		Cyanide	1	6	6	1	1	1	1	1	1	—	—	—	8

Notes:

⁽¹⁾See Tables 4-1, 4-3, 4-4, and 4-5 of the FSP for the specific analytical parameters to be analyzed for each matrix.

⁽²⁾The number of investigative samples depends on the duration of the SVE system operation. The numbers shown assume one year of operation and seven years of on- and off-site monitoring. See Section 4.0 of the FSP for a description of the frequency of sample collection per matrix.

⁽³⁾The field Quality Assurance/Quality Control (QA/QC) samples also include trip blanks, which are required for volatile organics samples. One trip blank, consisting of two 40-ml glass vials filled with organic-free, deionized water, will be included with each shipping container of volatile organic samples. The media used for field blanks is organic-free, deionized water. Trip blanks for the extraction trench vapor sampling for volatile organic compound (VOC) analysis will consist of one unbroken sampling tube per shipment.

⁽⁴⁾Collection of matrix spike/matrix spike duplicate (MS/MSD) samples are required only for organic analysis of water samples. Triple the normal sample volume will be collected for 1,1-DCA and other volatiles analyses, and double the normal volumes will be collected for BNAs and PCBs.

TABLE 4-2

SUMMARY OF INVESTIGATIVE AND QUALITY CONTROL SAMPLES TO BE COLLECTED

**ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

(Page 4 of 4)

^(a)For inorganics, organics in soil, and soil vapor analyses, no extra sample volume is required.

^(b)Sampling of on- and off-site subsurface water will be conducted simultaneously. With the exception of the 1,1-DCA, tin, and antimony analyses, for which the QA/QC samples are included with the on-site subsurface water samples, the field duplicate and blank samples for this matrix are included in the number of QA/QC samples shown for off-site subsurface water sampling.

^(c)Subsurface samples for inorganics and PCBs analyses will be filtered.

^(d)The MS/MSD sample for 1,1-DCA analysis is included with the on-site subsurface water samples.

^(e)Since the collection of additional subsurface and surface water background samples will coincide with the collection of samples from "background-only" locations, the QA/QC samples identified for the background-only locations will cover all of the background subsurface and surface water samples.

^(f)Since five of the background-only sampling events will coincide with the quarterly investigative sampling, no additional QA/QC samples are needed for those events.

Key:

1,1-DCA = 1,1-Dichloroethane

BNAs = Base Neutral/Acids

PCBs = Polychlorinated Biphenyls

TABLE 4-3**ACCEPTABLE SOIL CONCENTRATIONS⁽¹⁾****ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

Parameter	Acceptable Soil Concentration (ug/kg)
Volatile Organics:	
Acetone	490
Chlorobenzene	10,100
Chloroform	2,300
1,1-Dichloroethane	5.7
1,1-Dichloroethene	120
Ethyl Benzene	234,000
Methylene Chloride	20
Methyl Ethyl Ketone	75
Methyl Isobutyl Ketone	8,900
Tetrachloroethene	130
Toluene	238,000
1,1,1-Trichloroethane	7,200
1,1,2-Trichloroethane	22
Trichloroethene	240
Total Xylenes	195,000
Base Neutral/Acid Organics:	
Phenol	9,800

Note:

⁽¹⁾From Table 3-1 of Exhibit A to the Consent Decree.

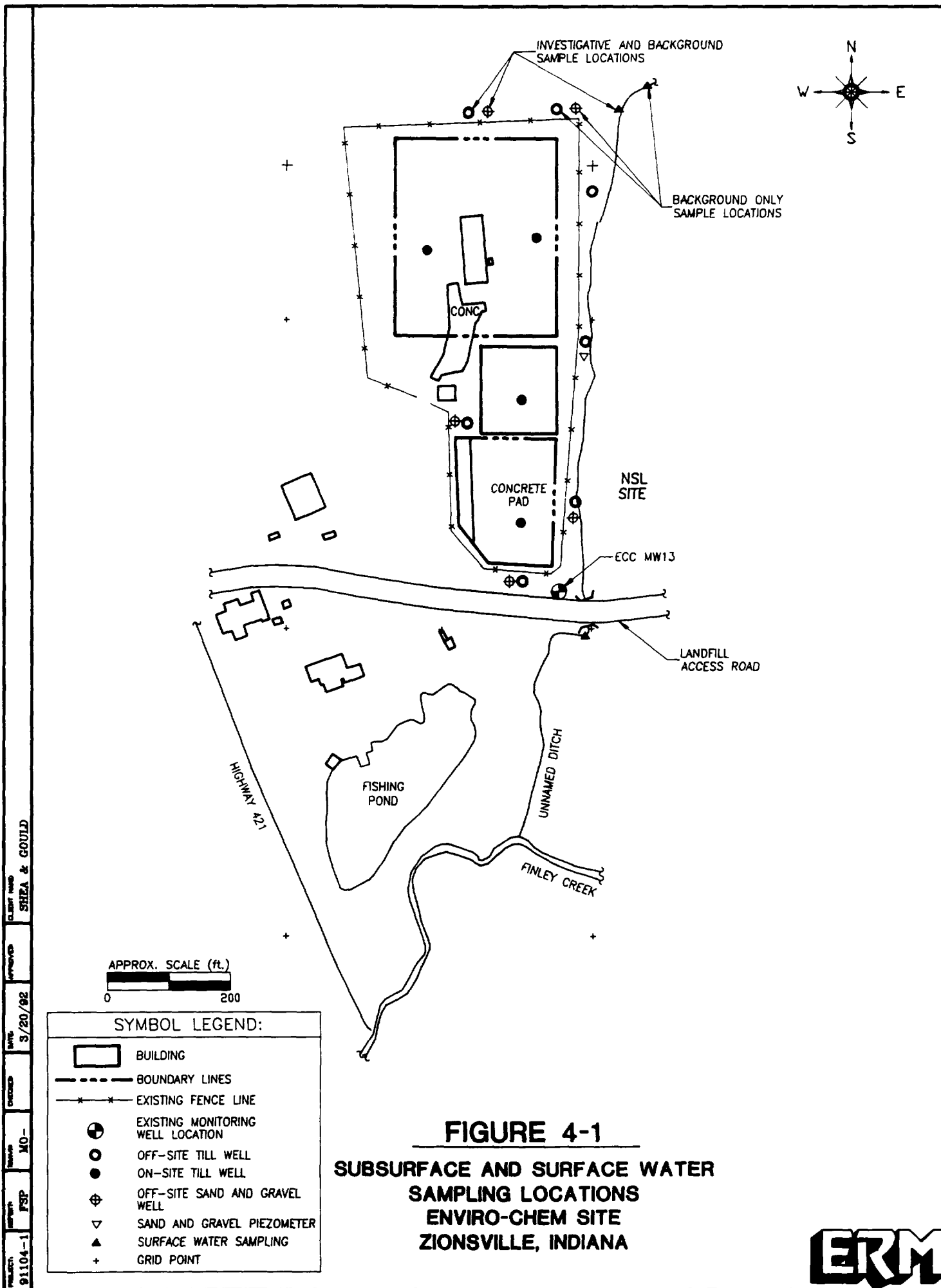
compliance with the Soil Sample Criterion as defined in Footnote 6 of Table 3-1 of Exhibit A to the Consent Decree, i.e., the arithmetic average of the 20 soil sample results for each parameter (assigning all nondetected results a value of one-half of the detection limit) must not exceed the values set forth in Table 3-1 of Exhibit A to the Consent Decree and included in Table 4-3 of this FSP, by more than 25 percent.

An additional 20 samples will be collected if the soil sampling results do not demonstrate compliance with the Soil Sample Criterion as defined in Footnote 6 of Table 3-1 of Exhibit A to the Consent Decree and the SVE system is operated for an additional period of time. These additional soil samples would be collected in the same approximate locations (i.e., within a 3-foot radius) as the original 20 sampling locations and would also be analyzed for the compounds listed in Table 4-3. Table 4-2 summarizes the number of soil samples to be collected, assuming that the first round of soil samples will meet the acceptable soil concentrations presented in Table 3-1 of Exhibit A to the Consent Decree.

Additionally, soil samples will be collected from the screened interval portion of each new monitoring well installed at the site and analyzed for particle size distribution. These results will be used to calculate the hydraulic conductivity of the till or sand and gravel units.

4.3 Subsurface Water

Two types of subsurface water monitoring systems will be sampled at the site: (1) four new investigative on-site till monitoring wells, and (2) six new investigative off-site till monitoring wells and five investigative off-site sand and gravel monitoring wells (four new wells and one existing well - ECC MW13). Figure 4-1 shows the locations for subsurface water sampling.



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Two additional new background locations (one well in the till and one in the sand and gravel unit) will also be sampled during the first year of monitoring, as described below.

The four new on-site investigative till monitoring wells will be sampled at the beginning of the SVE operation and quarterly thereafter until completion of the SVE program. After Soil Clean-up Verification has been demonstrated, sampling of the investigative on-site till monitoring wells will be conducted for seven years on a semiannual basis. The on-site till water samples will be analyzed for the parameters with Acceptable Subsurface Water Concentrations listed in Table 3-1 of Exhibit A to the Consent Decree and shown here in Table 4-4. To meet the On-Site Till Water Criterion, the concentrations of the parameters listed in Table 4-4 in samples collected from the on-site till wells must be at or below the Acceptable Subsurface Water Concentrations or the Applicable Subsurface Water Background Concentrations, whichever are highest, as defined in Footnote 2 of Table 3-1 of Exhibit A to the Consent Decree. The most recent quarterly sampling results from the four investigative on-site till water monitoring wells collected after the Soil Vapor Criterion has been achieved will be used to demonstrate compliance with the On-Site Till Water Criterion. The number of investigative subsurface till water samples shown in Table 4-2 assumes that the Soil Clean-up Verification will be accomplished in one year.

Investigative samples from the six off-site till monitoring wells, the four off-site sand and gravel monitoring wells, and the existing well ECC MW13 will also be collected quarterly during the operation of the SVE system. After the Soil Clean-up Verification has been accomplished, samples will be collected from the investigative off-site monitoring wells for seven years on a semiannual basis, unless Additional Work is required. The off-site subsurface water samples will be analyzed for the parameters with Acceptable Stream Concentrations listed in Table 3-1

TABLE 4-4

ON-SITE TILL WATER

ACCEPTABLE SUBSURFACE WATER CONCENTRATIONS

ENVIRO-CHEM SITE

ZIONSVILLE, INDIANA

(Page 1 of 2)

Parameter	Acceptable Subsurface Water Concentration ⁽¹⁾ (ug/l)
Volatile Organics:	
Acetone	3,500
Chlorobenzene	60
Chloroform	100
1,1-Dichloroethane	0.38
1,1-Dichloroethene	7
Ethyl Benzene	680
Methylene Chloride	4.7
Methyl Ethyl Ketone	170
Methyl Isobutyl Ketone	1,750
Tetrachloroethene	0.69
Toluene	2,000
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	0.61
Trichloroethene	5
Total Xylenes	440
Base Neutral/Acid Organics:	
Bis(2-ethylhexyl)phthalate	2.5
Di-n-Butyl Phthalate	3,500
Diethyl Phthalate	28,000
Isophorone	8.5
Naphthalene	14,000
Phenol	1,400

TABLE 4-4

ON-SITE TILL WATER

ACCEPTABLE SUBSURFACE WATER CONCENTRATIONS

ENVIRO-CHEM SITE

ZIONSVILLE, INDIANA

(Page 2 of 2)

Parameter	Acceptable Subsurface Water Concentration ⁽¹⁾ (ug/l)
Inorganics⁽²⁾:	
Antimony	14
Arsenic	50
Barium	1,000
Beryllium	175
Cadmium	10
Chromium VI	50
Lead	50
Manganese	7,000
Nickel	150
Silver	50
Tin	21,000
Vanadium	245
Zinc	7,000
Cyanide	154
Polychlorinated Biphenyls (PCBs)⁽²⁾:	0.0045 ⁽³⁾

Notes:

⁽¹⁾From Table 3-1 of Exhibit A to the Consent Decree.

⁽²⁾Dissolved, except for cyanide.

⁽³⁾The Acceptable Subsurface Water Concentration shown is for the sum of all PCBs present.

of Exhibit A to the Consent Decree and shown here in Table 4-5. The number of investigative samples shown in Table 4-2 assumes that the provisions of Section 4.3 of Exhibit A to the Consent Decree that trigger Additional Work are not met, and, therefore, investigative off-site subsurface water monitoring will be discontinued after seven years of Compliance Monitoring.

In accordance with Table 3-1 of Exhibit A to the Consent Decree, 12 subsurface samples will be obtained from wells upgradient of the site and analyzed to establish Applicable Subsurface Water Background Concentrations. The two investigative off-site, upgradient wells and two additional background wells will be sampled six times during the first year of operation to obtain 12 background levels each for the till and the sand and gravel unit. Five of the sampling events will coincide with the investigative off-site water sampling (i.e., the two additional background wells will also be sampled during the quarterly sampling events). The four background wells must also be sampled once more during the first year of monitoring, in the summer, between two quarterly sampling events. The well locations are shown in Figure 4-1.

Prior to ground water sampling, each well will be purged as described in Section 6.3.2.3. Static water levels will also be measured at each sampling event. In addition, the water level will be measured in the piezometer to be located on the eastern boundary of the site (Figure 4-1). Detailed procedures for water level measurement are described in Section 6.3.2.1.

4.4 Surface Water

Investigative surface water samples will be collected from the locations shown in Figure 4-1 (one upstream and one downstream location) at the same frequency as the investigative off-site subsurface water samples and will be analyzed for the parameters with Acceptable Stream

TABLE 4-5**OFF-SITE SUBSURFACE WATER AND SURFACE WATER
ACCEPTABLE STREAM CONCENTRATIONS****ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

Parameter	Acceptable Stream Concentration⁽¹⁾ (ug/l)
Volatile Organics:	
Chloroform	15.7
1,1-Dichloroethene	1.9
Ethyl Benzene	3,280
Methylene Chloride	15.7
Tetrachloroethene	8.9
Toluene	3,400
1,1,1-Trichloroethane	5,280
1,1,2-Trichloroethane	41.8
Trichloroethene	80.7
Base Neutral/Acid Organics:	
Bis(2-ethylhexyl)phthalate	50,000
Di-n-Butyl Phthalate	154,000
Diethyl Phthalate	52,100
Naphthalene	620
Phenol	570
Inorganics⁽²⁾:	
Arsenic	0.0175
Chromium VI	11
Lead	10
Nickel	100
Zinc	47
Cyanide	5.2
Polychlorinated Biphenyls (PCBs)⁽²⁾:	0.000079 ⁽³⁾

Notes:

⁽¹⁾From Table 3-1 of Exhibit A.

⁽²⁾Dissolved (except for cyanide) for subsurface water.

⁽³⁾The Acceptable Stream Concentration shown is for the sum of all PCBs present.

Concentrations shown in Table 3-1 of Exhibit A to the Consent Decree and here in Table 4-5. Also, an additional background surface water location will be sampled during the first year of monitoring (Figure 4-1) to establish the Applicable Surface Water Background Concentrations, as described in Table 3-1 of Exhibit A to the Consent Decree to the Consent Decree. Samples from this background location and the investigative upgradient location will be collected six times during the first year of operation to obtain the 12 background samples required to calculate the Applicable Surface Water Background Concentrations. Five of the sampling events will coincide with the investigative surface water sampling events. The number of surface water samples to be collected is summarized in Table 4-2.

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5.0 SAMPLE DESIGNATION

A sample numbering system has been developed for the Enviro-Chem project that will include the following sequential information:

- o Name of Site - Enviro-Chem (EC).
- o Sample Matrix - Combined extracted vapor (CV), individual trench extracted vapor (IV), subsurface water (TW or SW, to indicate a till or sand and gravel well), surface water (W), soil (S), and trip blank (TB).
- o Soil, trench, monitoring well, or surface water sampling location, or trip blank number.
- o Sample Depth (for soil samples only) - Upper depth or single depth (1) and lower depth (2).
- o Sample Round.
- o Quality Assurance/Quality Control (QA/QC) Modifiers - Field blank (B), field duplicate (D), and matrix spike/matrix spike duplicate (M).

For example, a sample from the till monitoring well 1 collected during the first round of ground water sampling, would be labeled ECTW1-1, and a field duplicate of that same sample would be designated ECTW1-1-D. An example of a soil sample designation is ECS7-1-1, which would be a Round 1 sample from location 7, collected in the upper sampling depth.

All field samples will be identified with sample identification labels consisting of gummed paper labels that include the sample designation and the following additional information:

- o Name of collector,
- o Affiliation of collector,
- o Day and time of collection,
- o Analysis requested, and
- o Analysis code.

6.0 SAMPLING EQUIPMENT AND PROCEDURES

Detailed procedures for sample collection and a general description of the proposed sampling equipment are presented in this section. Detailed information pertaining to equipment maintenance and calibration is presented in the QAPP. All sampling activities will be documented in the field logbook, as described in Section 5.1.2 of the QAPP.

6.1 Extracted Soil Vapor

Soil vapor samples will be collected from the combined vapor flow prior to entering the activated carbon system and individual trenches for volatile organic compound (VOC) analysis as follows:

- o A calibrated personal sampling pump (whose flow can be determined within ± 5 percent of the recommended flow rate) will be attached to the sampling tap installed on the SVE system;
- o A sampling train of two activated charcoal tubes (known as National Institute for Occupational Safety and Health (NIOSH) tubes - see Appendix C of the QAPP) will be connected in series to the personal sampling pump such that the soil vapor is pulled through the tubes before going through the pump;
- o The sample tap valve will be opened;

- o The volume of vapor required to allow attainment of the required method detection limits (10 liters) will be pumped at a flow rate of 0.2 liters per minute for a total of 50 minutes;
- o The sampling tap valve will be closed at the end of the sampling interval;
- o The activated charcoal tubes will be removed, capped, placed in sealable plastic "whirl pak" bags (supplied by Lancaster Laboratories), and labeled; and
- o The tubes will be carefully packed into glass screw-top jars with loose charcoal in the bottom, which will then be stored in a cooled container, separated from other types of environmental samples.

The phenol vapor samples will be collected as follows:

- o A calibrated personal sampling pump (whose flow rate can be determined within ± 5 percent of the recommended flow rate) will be attached to the sampling tap on the SVE system;
- o An XAD-7 sorbent tube (see Appendix C of the QAPP) will be connected to the personal sampling pump such that the soil vapor is pulled through the tube before going through the pump;

- o The sample tap valve will be opened;
- o The volume of vapor required to allow attainment of the required method detection limits (10 liters) will be pumped at a flow rate of 0.1 liters per minute for a total of 100 minutes.
- o The sampling tap valve will be closed at the end of the sampling interval;
- o The XAD-7 tubes will be removed, capped, placed in sealable plastic whirl pak bags, and labeled; and
- o The tubes will be carefully packed into glass screw-top jars with loose charcoal in the bottom, which will then be stored in a cooled container, separated from other types of environmental samples.

The soil vapor sampling procedures for VOCs and phenol analyses will be modified during the restart spike events by using a flow rate of 0.04 liters per minute for a total of 5 hours, starting 30 minutes after restarting the SVE system, as specified in Section 4.2.1 of Exhibit A to the Consent Decree.

Decontamination of the vapor sampling equipment will be conducted prior to any sampling and between sampling events by purging the sampling train (except the tubes) with nitrogen to remove any residual extracted soil vapor.

Field blanks will be obtained by drawing ambient air through the decontaminated sampling train and collecting those samples in sample tubes. The number of field blanks to be collected is one field blank per group of 10 or fewer investigative samples. No field blank will be collected for the combined vapor flow sampling (unless the combined vapor sampling coincides with the individual extraction trenches vapor sampling) because only one sample will be collected approximately 26 times (depending on the duration of SVE operation).

Trip blanks will consist of unbroken activated charcoal tubes that are kept with the investigative VOC samples from individual trenches throughout the sampling event. These unbroken tubes will then be broken at the beginning of the sampling event, capped, packaged for shipment with the other samples, and submitted to the laboratory for analysis. There will be one trip blank included in each sample shipping container. No trip blanks will be collected specifically for the combined vapor flow sampling.

Lancaster Laboratories will report if any breakthrough is observed in any of the vapor samples. If breakthrough does occur, the sampling rate and/or time of collection will be modified to avoid breakthrough in subsequent samples. However, after the organic levels have decreased as a result of the operation of the SVE, the originally planned sample rates and times should be reinstated.

6.2 Soil

Soil samples will be collected by using a 2-inch-diameter split-spoon sampler at the locations and depths specified by the USEPA and IDEM.

The procedure to obtain soil samples is as follows:

- o A 2-foot-diameter hole will be cut into the RCRA-compliant cover, keeping each cover layer separate.
- o Soil samples will be collected at the specified depths, taking into account the depth of the fill used to grade the site prior to installing the RCRA-compliant cover.
- o The RCRA-compliant cover layers will be replaced. A larger area of the sand, soil/fill, and topsoil layers will be removed to allow adequate sealing of the HDPE plastic membrane; the removed sand, soil/fill, and topsoil will be replaced to their original grade; and the areas will be reseeded.

One duplicate sample will be collected per group of 10 or fewer investigative samples. Drilling augers will be steam cleaned between each sampling location, and split-spoon samplers will be steam cleaned and rinsed with distilled water between the collection of each sample. Any other equipment that comes into contact with a sample will be decontaminated as described in Table 6-1.

6.3 Subsurface Water

Monitoring well installation procedures and subsurface water sampling protocols are described in this subsection.

TABLE 6-1

DECONTAMINATION PROTOCOL FOR SAMPLING EQUIPMENT

**ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**

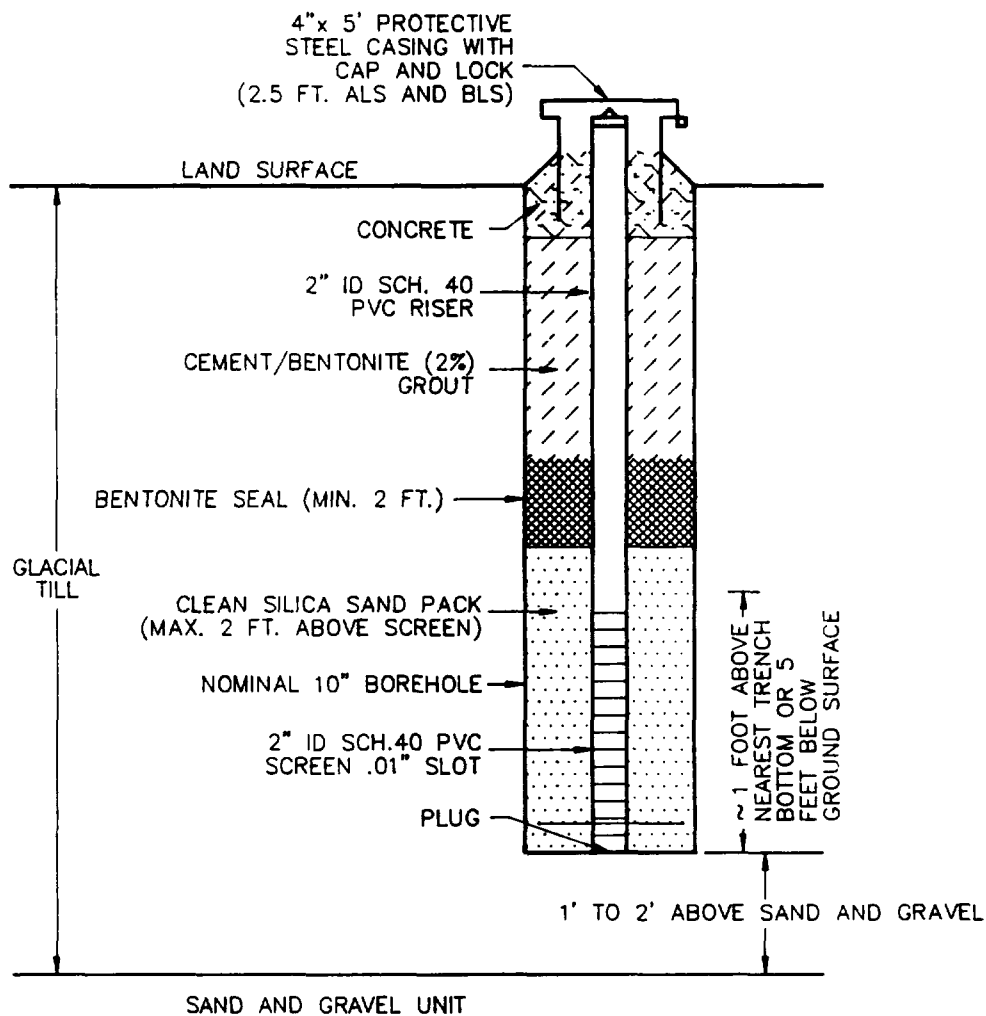
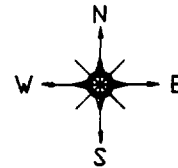
<u>Step Number</u>	<u>Description</u>
1	Scrub equipment thoroughly with soft-bristled brushes in a low-suds detergent solution.
2	Rinse equipment with tap water by submerging and/or spraying.
3	Rinse equipment with methanol by spraying until dripping; retain drippings.
4	Rinse equipment with distilled water by spraying until dripping; retain drippings.
5	Rinse equipment with distilled water a second time by spraying until dripping; retain drippings.
6	Place equipment on plastic or aluminum foil and allow to air dry for five to ten minutes.
7	Wrap equipment in aluminum foil (shiny side out) for handling and/or storage until next use.

6.3.1 Monitoring Well Installation

During the first year of monitoring, the subsurface water monitoring network will consist of 17 wells that will be located on and around the periphery of the Enviro-Chem Site. Eleven new wells will be completed in the saturated till, and five new wells will be installed in the sand and gravel unit underlying the saturated surface till. The wells will be constructed of 2-inch PVC. One existing well, ECC MW13, will also be sampled. One off-site till well and one off-site sand and gravel well (shown in Figure 4-1 as background wells) will be sampled only during the first year of monitoring to establish the Applicable Subsurface Water Background Concentrations. Only 15 wells will be sampled afterwards.

The wells will be installed after the RCRA cap is in place. Screen length in the new wells will vary. The off-site wells completed in the till will be screened from the top of the till layer to 1 to 2 feet less than the total depth to the contact between the till and underlying sand and gravel unit. On-site till wells will be screened from 1 foot above the bottom of adjacent trenches to 1 to 2 feet above the contact between the till and underlying sand and gravel unit. Wells completed in sand and gravel will be screened over the total thickness of the sand and gravel unit. Figures 6-1, 6-2, and 6-3 present schematic diagrams of well construction for the off-site monitoring wells in the till, the on-site monitoring wells in the till, and the monitoring wells in the sand and gravel unit, respectively.

For the on-site till wells, a sampling port will be fabricated in the HDPE plastic membrane that will prevent infiltration of air around these monitoring wells during the operation of the SVE system. The design of this sampling port is shown on Figure 6-4.

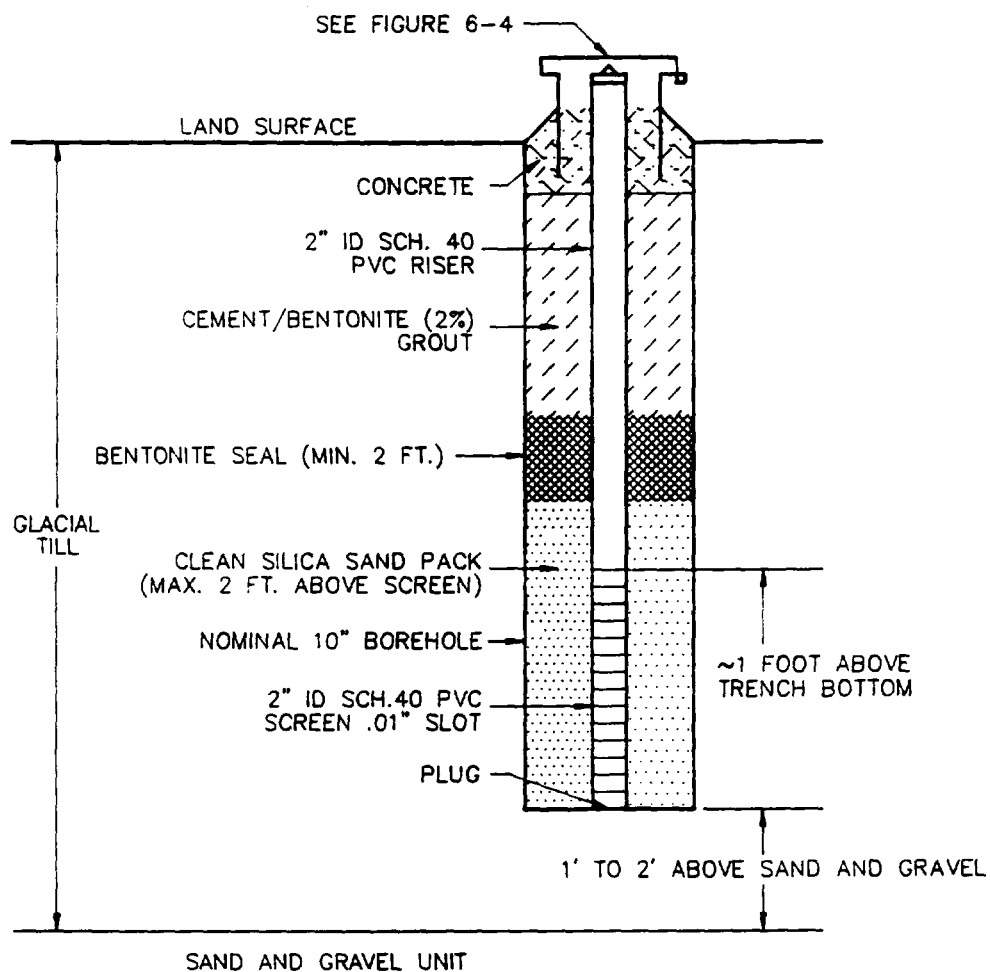


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FIGURE 6-1

**TYPICAL MONITORING WELL CONSTRUCTION DETAIL
OFF-SITE WELL IN GLACIAL TILL
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**





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FIGURE 6-2

TYPICAL MONITORING WELL CONSTRUCTION DETAIL
ON-SITE WELL IN GLACIAL TILL
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA



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MONITORING WELL CONSTRUCTION

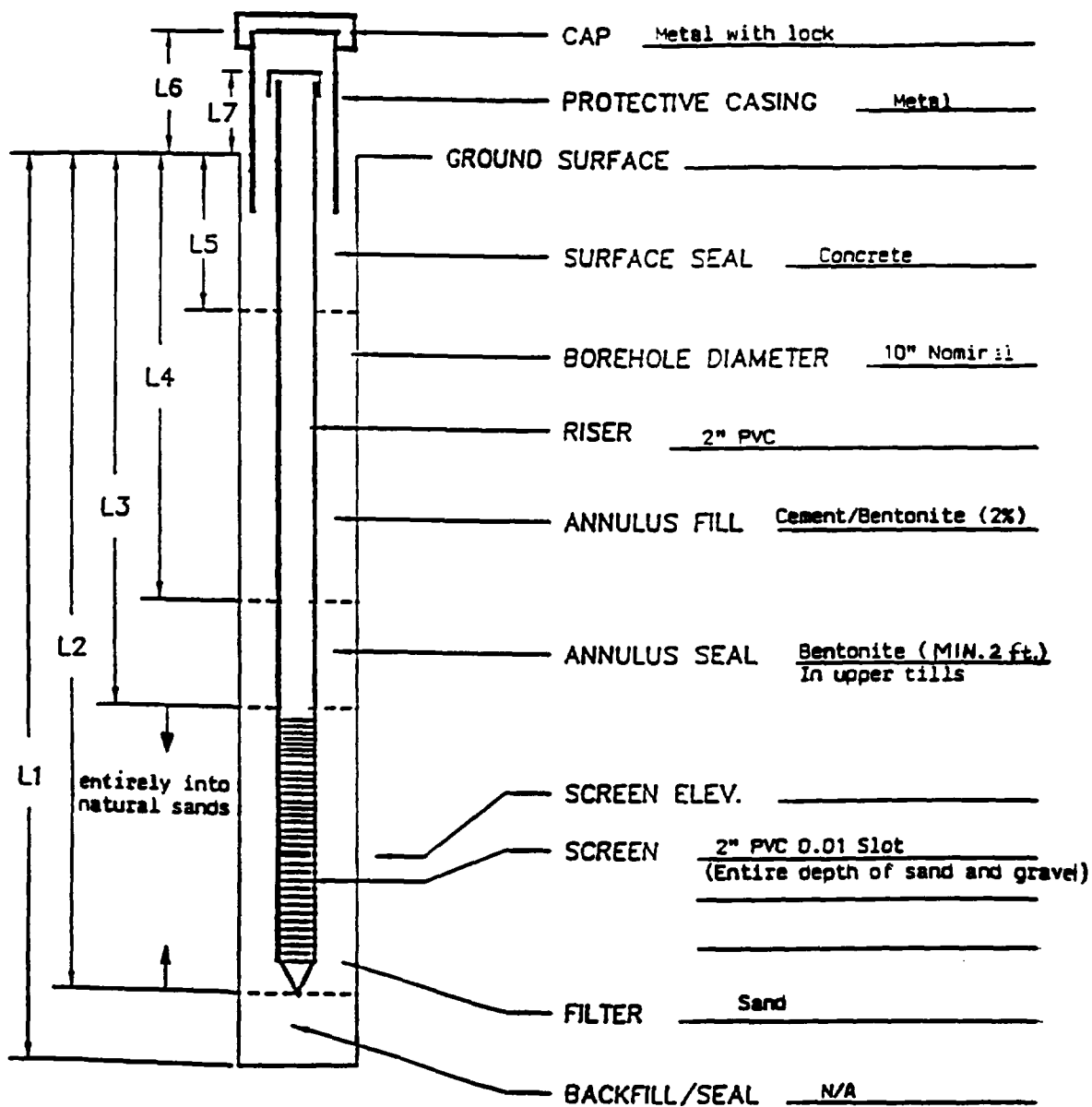
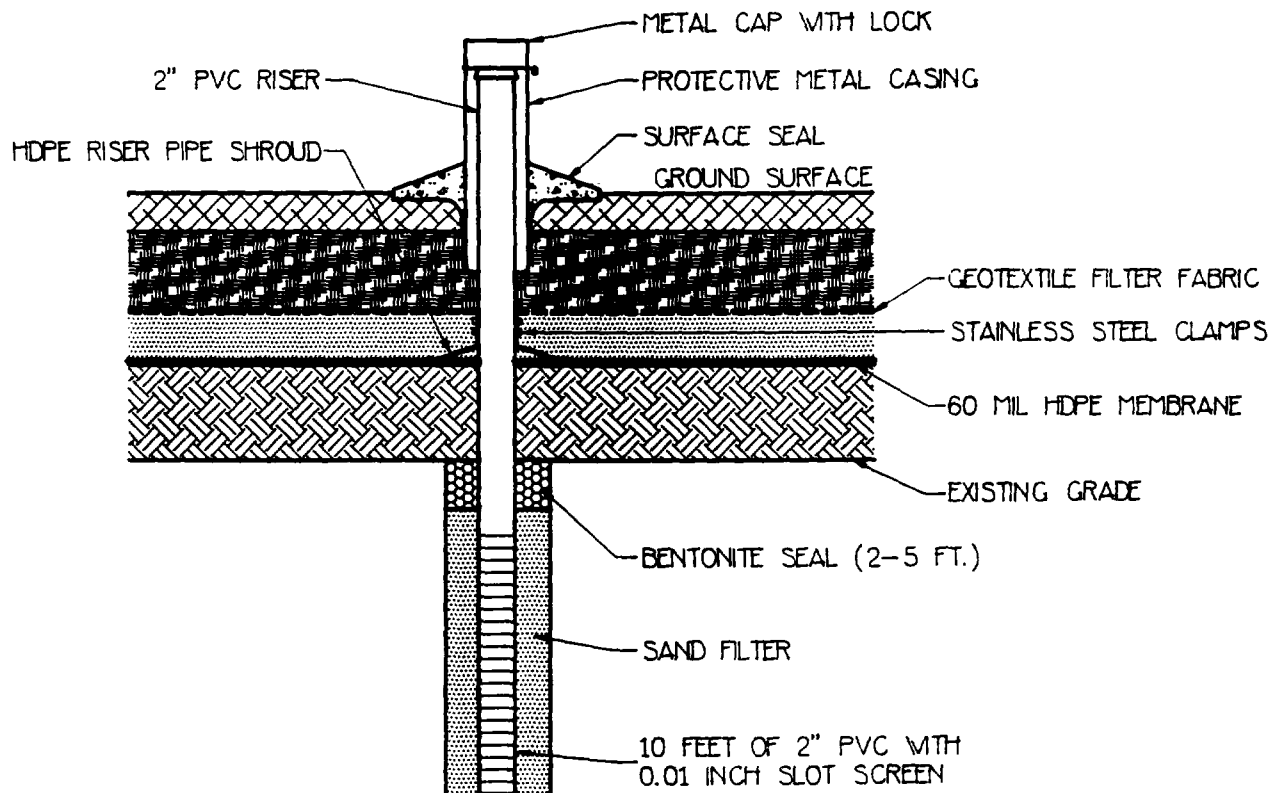


FIGURE 6-3

**TYPICAL MONITORING WELL CONSTRUCTION DETAIL
WELL IN SAND AND GRAVEL
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**





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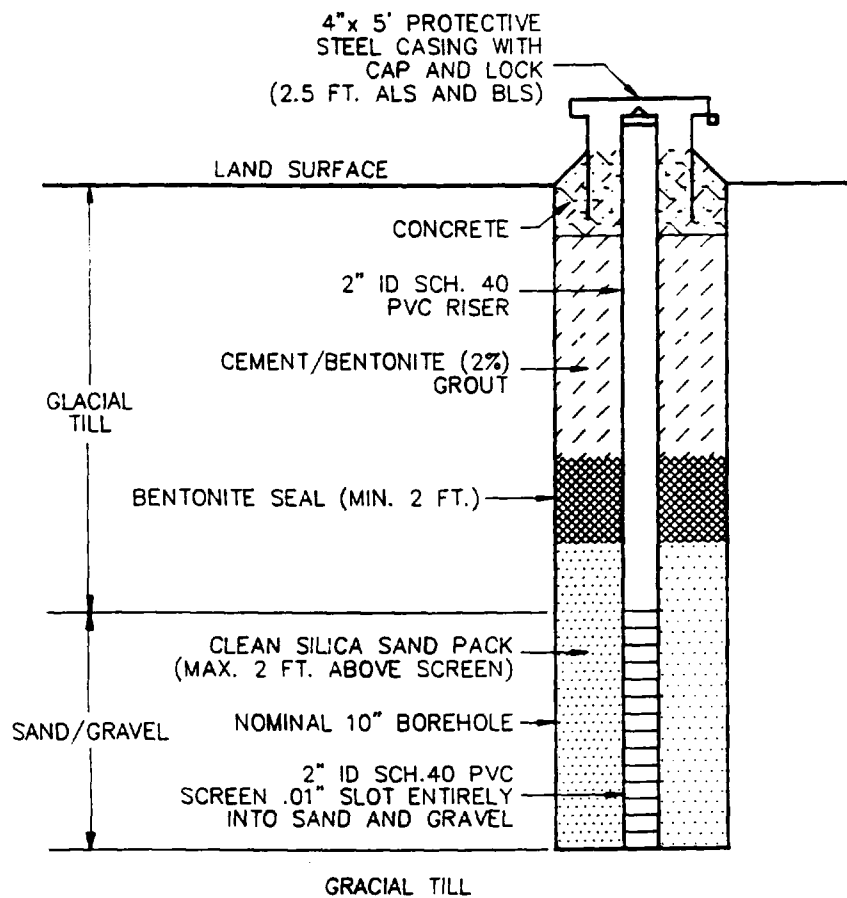
SYMBOL LEGEND:	
	
CONCRETE	TOP SOIL
	
MISC. SOIL/FILL	COMPACTED NATIVE SOIL
	
BENTONITE	SAND COVER

FIGURE 6-4
SAMPLING PORT DETAIL
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA

To aid in defining the direction of subsurface water flow in the sand and gravel unit, a piezometer will be installed at the location shown in Figure 4-1. Details of the piezometer construction are shown in Figure 6-5.

The following procedures will be used to install the monitoring wells:

- o To assist in determining the proper screen length of each till well, a soil boring will be advanced next to each till well location to locate the beginning of the till layer and the depth of the interface between the till and the underlying sand and gravel unit.
- o Wells will be advanced using a nominal 6-inch I.D., hollow-stem auger to total depth. All cuttings will be drummed and disposed of at an off-site hazardous waste facility.
- o Soil above the water table will be logged and sampled continuously with a 2-inch-diameter, split-spoon sampler. Split-spoon samples of the soil below the water table will be collected at every 5-foot interval and described in the field logbook.
- o A single soil sample will be obtained from the screened interval portion of each monitoring well installed at the site by using the split-spoon sampler with a spring retainer attachment. This sample will be analyzed for particle size distribution, and the analytical results will be used to calculate hydraulic conductivity. A



NOT TO SCALE

FIGURE 6-5

**TYPICAL PIEZOMETER CONSTRUCTION DETAIL
INSTALLED IN SAND AND GRAVEL
ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA**



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duplicate sample will be collected for every group of ten or fewer samples.

- o The well screen will be constructed of 2-inch-diameter PVC with No. 10 (0.01-inch) continuous slot openings. The PVC screen will extend above the water table, and the PVC riser pipe will be installed from the top of the screen to the surface. The screen and risers will be installed in the boring prior to removal of the augers. The length of the well screen will vary as previously described.
- o The formation will be allowed to collapse around the screen and rise to a maximum of 2 feet above the screen. If the formation does not collapse or fill the annular space to this level, clean silica sand will be added. The sand will be free of silt and of an appropriate size for the well screen slot openings.
- o A minimum of 2 feet of compressed bentonite pellets will be placed above the sand pack to seal the annular space around the casing.
- o The remaining space above the bentonite seal will be filled with a cement-bentonite grout placed with a tremie pipe. The grout seal shall be prepared of a mixture of one bag of Portland cement, 5 pounds of bentonite powder, and 10 gallons of water.

- o The riser pipe will be fitted with a vent cap.
- o For on-site wells, cap and cover materials will be compacted by hand around the well riser pipe. A perforated shroud constructed of HDPE liner material will be secured to the well casing and welded to the HDPE liner to prevent infiltration of water along the casing wall.
- o For the off-site wells, a 4-inch-diameter protective steel casing with a hinged locking steel cover will be cemented in place to a depth of 2.5 feet below the ground surface. The cement will be sloped away from the casing to promote drainage away from the well. All equipment used in construction of the wells will be decontaminated prior to the initiation of well construction. Drilling augers will be steam cleaned between the advancement of each boring.
- o All wells will be labeled with an engraved PVC plate identifying the monitoring well number.

Following installation, monitoring wells will be developed to provide low-turbidity, representative subsurface water samples. Well development will be completed no sooner than 24 hours following the grouting of the wells. Each well will be developed by surging or pumping until: (1) at least three well volumes have been removed; (2) the well yields low turbidity water; and (3) consistent values of temperature, pH, and specific conductance have

been obtained. Equipment used in well development may include surge blocks, bailers, or pumps. Subsurface water removed during well development will be collected, stored in containers, and handled as appropriate in accordance with Federal, State, and local regulations based on the results of chemical analysis.

The piezometer will be constructed in a manner similar to the subsurface water monitoring wells. A 2-inch PVC screen that has a slot size of 0.010 inches and a length that straddles the sand and gravel unit will be installed for the piezometer.

6.3.2 Subsurface Water Sampling

Samples from the subsurface wells will be collected quarterly during the operation of the SVE system and analyzed as specified in Section 4.3. Compliance monitoring will be continued on a semiannual basis for seven years after Soil Clean-up Verification is accomplished, as specified in Section 4.0 of Exhibit A to the Consent Decree.

6.3.2.1 Water Level Measurement

Static water levels will be measured to the nearest 0.01 foot in each monitoring well and the piezometer at each sampling event and recorded in the field notebook. The water level surface will be measured prior to well development and sampling by using an electric water level meter. Before lowering the probe in the well, the batteries will be checked by pressing the test button on the instrument. The probe will be slowly lowered into the well until contact with the water surface is indicated on the meter. The probe will be withdrawn just above the water surface, and a second reading will be taken prior to withdrawing the probe from the well. Both readings

will be recorded in the field logbook. The probe will be decontaminated prior to inserting the instrument into a well by washing with a detergent such as Alconox, rinsing with methanol, and rinsing three times with distilled water.

Each well will have a reference point, indicated on the well casing, from which water level measurements will be taken. The reference point elevation on the well will be established by a survey with respect to U.S. Datum mean sea level elevation to an accuracy of 0.01 feet for computation of the subsurface water elevation.

6.3.2.2 Well Depth Measurement

The total depth of the well will be measured and recorded prior to well development and sampling. A weight tied to a length of cotton cord will be used to tag the bottom of the well, and the length of cord used will be measured to establish well depth. The weight will be rinsed with distilled water and the cotton cord will be replaced between measurements.

6.3.2.3 Well Evacuation

Standing water in the wells will be removed prior to sampling by purging until: (1) at least three well volumes have been removed; (2) the well yields low turbidity water; and (3) consistent values of temperature, pH, and specific conductance are achieved. If the well goes dry before three well volumes have been removed, samples will be taken as soon as the well recovers. The calculation of well volume will be as follows:

- o The well casing inside diameter will be measured.

- o The static water level below the measuring point will be determined.
- o The total depth of the well will be identified from the measuring point.
- o The number of linear feet of static water will be calculated as the total depth of the well minus the static water level.
- o The static volume (well volume) will be calculated in gallons as:

$$V = (\pi r^2)(h)(7.48)$$

Where:

V = well volume (gal),

π = 3.14,

r = well radius (ft), and

h = linear feet of static water (ft).

Dedicated Teflon bailers will be used for purging and sampling the wells. Purged water will be placed in containers for subsequent handling and disposal in accordance with Federal, State, and local regulations based upon the results of chemical analysis. Bailers, pumps, and all other equipment shall be decontaminated prior to insertion into the well. Decontamination will consist of steam cleaning or washing with a detergent such as Alconox, rinsing with methanol, and rinsing three times with distilled water. Bailer ropes and sampling gloves will be discarded after sampling each well.

6.3.2.4 Sample Withdrawal

During sample withdrawal, special care will be taken to avoid physically altering or chemically contaminating the samples. Sampling will be performed with bottom-filling Teflon bailers. Subsurface water pH, specific conductance, and temperature will be determined in the field on secured samples. Samples will be collected in the following order:

- o Volatile organics,
- o Base neutral/acid extractable organics,
- o Polychlorinated biphenyls (PCBs),
- o Metals, and
- o Cyanide.

*Subsurface
water
samples
filtered*

Samples of subsurface water will be prepared, preserved, and stored as described in Section 7.0. All sampling equipment will be decontaminated between samples following the procedures in Table 6-1.

The objective of the subsurface water sampling for the metals and PCBs shown in Table 4-4 is to determine the concentration of dissolved constituents. Therefore, subsurface water samples for metals and PCB analyses will be filtered through a nonmetallic 0.45-micron pore size membrane immediately after collection. One of the following apparatus will be used for field filtration: (1) a Sartorius filtration apparatus, or (2) a Nalgene filtration apparatus. If necessary, the sample may be pumped through the filter using a Nalgene hand vacuum pump. The first 150 to 200 ml of filtrate will be used to rinse the filtration apparatus of any contaminants. This technique minimizes the risk of altering the composition of the samples by the filtering

operation. The filtrate for metals analysis will be collected in a polyethylene bottle and immediately acidified to a pH <2 using nitric acid. The filtrate for chromium VI analysis will not be acidified. The filtrate for PCB analysis will be collected in amber glass bottles.

One field blank sample will be collected for each group of 10 or fewer investigative samples. Water field blank samples will be prepared immediately after collection of a field sample by pouring distilled water through a decontaminated bailer into the appropriate sample container. Preparation of the field blank will occur on site.

One field duplicate sample will be obtained for each group of 10 or fewer investigative samples, as shown in Table 4-2. Each water field duplicate sample will be prepared as follows (except samples for volatile organic analyses):

- o Twice the amount of sample volume required will be collected in a dedicated sample bottle.
- o The water sample container will be filled to half its volume by pouring from the dedicated sample bottle.
- o The duplicate water sample container will then be filled to half its volume by pouring from the dedicated sample bottle.

- o The water sample container will then be completely filled by pouring from the dedicated sample bottle.
- o Finally, the duplicate water sample container will be completely filled by pouring from the dedicated sample bottle.

Field duplicate samples for volatile organics analysis will be collected in an alternating manner (i.e., one water sample vial will be filled, then one duplicate sample vial will be filled).

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of one per group of 20 or fewer investigative samples designated for organics analysis, following the foregoing procedures for the collection of duplicate samples.

Trip blank samples will be provided by CompuChem Laboratories at a frequency of one per shipping container of samples for volatile organic analysis.

6.4 Surface Water

The surface water will be monitored by sampling the unnamed ditch just upstream and just downstream of the Enviro-Chem Site (Figure 4-1). An additional upstream sampling location will be selected as a second background location for determining the Applicable Surface Water Background Concentrations. To collect a surface water sample, the sample container will be submerged in the water, removed, and immediately capped. The container mouth will be positioned so that it faces upstream, while the sampling personnel are standing downstream to prevent the stirring up of any sediments that would contaminate the sample. Quality control

samples (field blanks, field duplicates, and MS/MSD samples) will be collected at the same frequency as specified for subsurface water samples. Decontamination of sampling equipment will consist of washing with a detergent such as Alconox, rinsing with methanol, and rinsing three times with distilled water.

7.0 SAMPLE HANDLING AND ANALYSIS

The required sample containers, preservation methods, maximum holding times, and filling instructions for each sample type are summarized on Table 7-1. Notations of which laboratory will be performing the analyses of the collected samples are also indicated on Table 7-1.

Sample bottles provided by CompuChem Laboratories will be prepared by using the procedures required by the Contract Laboratory Program (CLP). Sample bottles provided by IEA, Inc. will be prepared as described in their standard operating procedure (SOP) in Appendix E of the QAPP. Sample tubes for extracted soil vapor will be provided by Lancaster Laboratories. New mason jars will be used for collecting soil samples for particle size analysis. Sample chain-of-custody procedures are contained in the QAPP.

Waste generated on site will be properly handled and disposed of to prevent contamination of clean areas in accordance with Federal, State, and local regulations.

7.1 Sample Packaging and Shipment

Following sampling, the outside of the sample bottles will be rinsed with potable or distilled water near the sampling location. The sample packaging and shipment procedures will be as follows:

- o The sample will be properly preserved (if applicable) and liquid levels will be marked if bottles are partially full.

TABLE 7-1

SAMPLE CONTAINER AND PRESERVATION REQUIREMENTS

ENVIRO-CHEM SITE
ZIONSVILLE, INDIANA

(Page 1 of 2)

Matrix/Parameters	Container	Preservation	Maximum Holding Time ⁽¹⁾	Filling Instructions
Vapor Parameters⁽²⁾:				
Volatile Organics	Activated Charcoal Tubes	Cool 4° C	7 days	Cap tube ends
Phenol	XAD-7 Tubes	Cool 4° C	14 days	Cap tube ends
Soil Chemical Parameters⁽³⁾:				
Volatile Organics	One 4-oz, wide-mouth glass jar with Teflon-lined cap	Cool 4° C 4 drops HCl	14 days	Zero headspace, pack tightly
Base Neutral/Acid Organics	One 1-liter, wide-mouth amber glass jar with Teflon-lined cap	Cool 4° C	14 days until extraction/ 40 days until analysis	At least 3/4 full
Subsurface Water/Surface Water Parameters⁽⁴⁾:				
1,1-DCA	Three 40-ml glass vials with Teflon-lined septum	Cool 4° C HCl to pH < 2	14 days	Zero headspace, no air bubbles
Other Volatile Organics	Two 40-ml glass vials with Teflon-lined septum	Cool 4° C HCl to pH < 2	14 days	Zero headspace, no air bubbles
Base Neutral/Acid Organics	Three 1-liter amber glass bottles with Teflon-lined cap	Cool 4° C	7 days until extraction/ 40 days until analysis	Fill to neck of bottle
Polychlorinated Biphenyls (PCBs)	Two 1-liter amber glass bottles with Teflon-lined cap	0.45 u filtration (subsurface water only) Cool 4° C	7 days until extraction/ 40 days until analysis	Fill to neck of bottle
Chromium VI	One 250-ml polyethylene bottle	0.45 u filtration (subsurface water only) Cool 4° C	24 hours	Fill to neck of bottle
Tin	One 500-ml polyethylene bottle	0.45 u filtration (subsurface water only) HNO ₃ to pH < 2 Cool 4° C	6 months	Fill to neck of bottle

TABLE 7-1

SAMPLE CONTAINER AND PRESERVATION REQUIREMENTS

ENVIRO-CHEM SITE
 ZIONSVILLE, INDIANA
 (Page 2 of 2)

Matrix/Parameters	Container	Preservation	Maximum Holding Time ⁽¹⁾	Filling Instructions
Antimony and Arsenic	One 2-liter Teflon container (I-Chem 200 series)	0.45 u filtration (subsurface water only) HNO ₃ to pH < 2 Cool 4° C	6 months	Fill to neck of bottle
Other Metals	Two 500-ml polyethylene bottles	0.45 u filtration (subsurface water only) HNO ₃ to pH < 2 Cool 4° C	6 months/ 28 days for Hg	Fill to neck of bottle
Cyanide	One 1-liter glass bottle with Teflon-lined cap	NaOH to pH > 12 Cool 4° C	14 days	Fill to neck of bottle
Soil for Particle Size Distribution	One 1-pint, Mason-type jar with tight-fitting lid	None	None	About 3/4 full

Notes:

- (1) All holding times are from the date of sample collection.
- (2) Vapor parameters to be analyzed by Lancaster Laboratories. List of parameters is shown in Table 4-1.
- (3) Soil chemical parameters to be analyzed by CompuChem Laboratories. List of parameters is shown in Table 4-3.
- (4) Subsurface water and surface water parameters to be analyzed by CompuChem Laboratories, except for antimony and arsenic, which will be analyzed by IEA, Inc. List of parameters is shown in Table 4-4 (on-site wells) and Table 4-5 (off-site wells and surface water).

- o Custody tags will be securely attached to the sample container, and each container will be placed in a Ziploc baggie.
- o The sample containers will be placed in a cooler lined with 2 inches of vermiculite or equivalent absorbent material and maintained at 4° C with cold packs or ice sealed in plastic bags as appropriate. The remaining space in the cooler will be filled with additional packing material.
- o The chain-of-custody forms and traffic reports will be placed in a Ziploc bag, and the bag will be taped to the inside of the cooler lid.
- o The cooler will be closed and sealed shut with strapping tape. If the cooler has a drain port, that port will also be sealed shut with tape. One custody seal will be placed across the front of the cooler, and another seal will be affixed across the hinge area at the back of the cooler. These custody seals will be covered with clear tape.
- o An airbill with shipper's and consignee's addresses will be affixed to the top of the cooler. If liquid samples are being shipped, "This End Up" labels will be placed appropriately.

- o The samples will be shipped to the appropriate laboratory by using an overnight service.
- o The laboratory will be notified that it will be receiving the samples.

Sample custody procedures are detailed in Section 5.0 of the QAPP. The sample to be analyzed for chromium VI will be hand delivered to EMS Heritage Laboratories, Inc., located in Indianapolis, Indiana.

7.2 Sample Analysis

Samples will be analyzed following the methods listed in Section 7.0 of the QAPP.